REMARKS

The Office Action dated April 30, 2008 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1, 39, and 77 have been amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter is being presented, and approval and entry are respectfully requested. As will be discussed below, it is also requested that all of claims 1-4, 39-42 and 77-80 be found allowable as reciting patentable subject matter.

Claims 1-4, 39-42 and 77-80 are pending and under consideration.

OBJECTIONS TO THE CLAIMS:

Claims 1, 39, and 77 were objected to for minor informalities. Claims 1, 39, and 77 has been amended to correct such minor informalities. Accordingly, it is respectfully requested that the objection to the claims be withdrawn.

REJECTION UNDER 35 U.S.C. § 102:

Claims 1-4, 39-42 and 77-80 were rejected under 35 U.S.C. § 102 as being anticipated by Ikeda (U.S. Patent No. 6,304,813) ("Ikeda"). The Office Action took the

position that Ikeda describes all the recitations of independent claims 1, 39, and 77 and related dependent claims. This rejection is traversed and reconsideration is requested.

Independent claim 1, upon which claims 2-4 are dependent, recites an apparatus for controlling a temperature of an exhaust gas sensor disposed in an exhaust passage of an internal combustion engine and having an active element for contacting an exhaust gas flowing through the exhaust passage and a heater for heating the active element. The apparatus includes means for sequentially acquiring element temperature data representing the temperature of the active element, and means for sequentially acquiring heater temperature data representing the temperature of the heater. The apparatus also includes heater control means for sequentially generating a control input which defines an amount of heat generating energy supplied to the heater so as to equalize the temperature of the active element represented by the element temperature data to a predetermined target temperature, and controlling the heater depending on the control input. The control input generated by the heater control means includes at least an input component depending on a difference between the temperature of the active element represented by the element temperature data and the target temperature and an input component depending on the temperature of the heater represented by the heater temperature data.

Independent claim 39, upon which claims 40-42 are dependent, recites a method of controlling a temperature of an exhaust gas sensor disposed in an exhaust passage of

an internal combustion engine and having an active element for contacting an exhaust gas flowing through the exhaust passage and a heater for heating the active element. The method includes sequentially acquiring element temperature data representing the temperature of the active element and heater temperature data representing the temperature of the heater, and sequentially generating a control input which defines an amount of heat generating energy supplied to the heater so as to equalize the temperature of the active element represented by the element temperature data to a predetermined target temperature, and controlling the heater depending on the control input. When the control input is generated, the control input is generated so as to include at least an input component depending on a difference between the temperature of the active element represented by the element temperature data and the target temperature and an input component depending on the temperature of the heater represented by the heater temperature data.

Independent claim 77, upon which claims 78-80 are dependent, recites a recording medium readable by a computer and storing a temperature control program for enabling the computer to perform a process of controlling a temperature of an active element of an exhaust gas sensor disposed in an exhaust passage of an internal combustion engine and having the active element for contacting an exhaust gas flowing through the exhaust passage and a heater for heating the active element. The temperature

control program includes a program for enabling the computer to perform a process of sequentially acquiring element temperature data representing the temperature of the active element and heater temperature data representing the temperature of the heater, and a control input generating program for enabling the computer to perform a process of sequentially generating a control input which defines an amount of heat generating energy supplied to the heater so as to equalize the temperature of the active element represented by the element temperature data to a predetermined target temperature. The temperature control program also includes a program for enabling the computer to perform a process of controlling the heater depending on the control input. The control input generating program has an algorithm for enabling the computer to generate the control input so as to include at least an input component depending on a difference between the temperature of the active element represented by the element temperature data and the target temperature and an input component depending on the temperature of the heater represented by the heater temperature data.

As will be discussed below, Ikeda fails to disclose or suggest the elements of any of the presently pending claims.

Ikeda discloses an oxygen concentration sensor that is used to detect a wet condition of a sensor element. The oxygen concentration detector is designed to reduce the chances that an element of an air-fuel ratio sensor cracks due to thermal shock

resulting from the wetting of the element of the air-fuel ratio sensor. The detection may include certain instances, for example, when the air-fuel ratio sensor is preheated for activation before or during an engine is started for operation.

In one example, an oxygen concentration detector may include an air-fuel ratio sensor 1, a heater 4 that heats the air-fuel ratio sensor 1, a heater controller (part of the main controller A/FCU 10) that supplies electric power to the heater so that the air-fuel ratio sensor reaches an activation temperature. The oxygen concentration detector also includes an element temperature detector 2 that detects the temperature of an element of the air-fuel ratio sensor 1.

The controller 10 detects a rate of decrease in the element temperature of the air-fuel ratio sensor based on the temperature detected by the element temperature detector 2, and determines whether the sensor element has been wetted based on the detected rate of temperature change. When wetting is detected, the controller controls the supply of electric power to the heater in an effort to attenuate thermal shock by preventing the heater from being heated too quickly. The element temperature detector 2 can be configured to detect an element temperature of the air-fuel ratio sensor 1 based on an element impedance of the air-fuel ratio sensor 1.

The process of attenuating the heater is most clearly described by, at least, independent claims 1, 5, 12 and 15. Claim 1, and similarly claim 12, disclose that the

process of attenuating the heater is based on a measured "rate of decrease in the temperature of the element of the air-fuel ratio sensor based on the temperature of the element detected by the element temperature detector" (see column 17, lines 47-54 of Ikeda, i.e., claim 1). Claim 5 discloses a separate embodiment which discloses making a prediction as to whether the sensor element is wet and limiting the supply to the heater based on the prediction. Claim 15 recites similar claim features as claim 5. As can be seen from the various embodiments of Ikeda, the measure of whether to attenuate or change the heater's power supply is based on a temperature rate of change and comparing that actual rate of temperature change to a reference value rate of change (Emphasis added).

Contrary to the contentions made in the Office Action, Ikeda does not teach or suggest generating control input, generated by said heater control means, for the controller which includes determining "the difference between the temperature of the active element...and said target temperature...and the temperature of the heater", as recited, in part, in independent claim 1, and similarly in independent claims 39 and 77. Ikeda is limited to measuring a temperature rate of change in determining whether to alter the supply of electric power to the heater. Ikeda does not disclose heater control means that includes the above noted features of the claims. Therefore, Applicants respectfully

submit that Ikeda does not anticipate all of the claim recitations disclosed in independent claims 1, 39 and 77, and by virtue of dependency claims 2-4, 40-42 and 78-80.

Furthermore, in Ikeda, the electric power supplied to the heater is set in the following three situations:

1) If the element temperature of the oxygen sensor is higher or equal to the activation temperature (element impedance Zdc > 30Ω), the electric power control DUTY is determined according to the following equations, so that the element temperature of the oxygen sensor equals to the activation temperature (please refer to IKEDA / column 9, line 29-50, Fig. 4 steps 405-406-404).

DUTY = GP + GI + c … a, b and c are constants

GP = a (Zdc — 30) • • • proportional term

GI = GI + b (Zdc — 30) •• integrating term

2) If the heater temperature has reached threshold temperature (heater resistance Rh ≥ 2.1 Ω), the electric power control DUTY is set within the range of 20—0% depending on the heater resistance (See Ikeda, column 8, line 43- column 9, line 29, Fig. 4 steps 405- 407- 408-409-411, Fig. 5).

3) If the heater temperature is lower than the threshold temperature (heater resistance Rh <2.1Ω), the electric power control DUTY is set at 100 or 0 % depending on the change of the element temperature (T1) of the oxygen sensor and the coolant temperature (THW).

In above 1), the electric power control DUTY is set using the element impedance Zdc, which is a reference value of the element temperature of the oxygen sensor, and the electric power control value does not include an input component depending on the heater temperature (Emphasis added).

In above 2), the electric power control DUTY is set using the heater resistance (Rh), which is a reference value of the heater temperature, and the electric power control value does not include an input component depending on the element temperature of the oxygen sensor.

In above 3), the electric power control DUTY is being merely switched to 0 % or 100 %, and the electric power control value does not include an input component depending on the element temperature of the oxygen sensor and an input component depending on the heater temperature (Emphasis added).

In view of the above, Ikeda does not disclose a feature to generate a control input to the heater by using the two components "an input component depending on the difference between the temperature of the active element represented by the element temperature data and the target temperature" and "an input component depending on the temperature of the heater represented by the heater temperature data" as recited in independent claims 1, 39, and 77.

Therefore, Applicants respectfully submit that Ikeda does not anticipate all of the claim recitations disclosed in independent claims 1, 39 and 77, and by virtue of dependency claims 2-4, 40-42 and 78-80. It is respectfully requested that the anticipatory rejection to the pending claims be withdrawn.

Claims 1-4, 39-42 and 77-80 were rejected under 35 U.S.C. § 102 as being anticipated by Hoshi (U.S. Patent No. 5,214,267) ("Hoshi"). The Office Action took the position that Hoshi describes all the recitations of independent claims 1, 39, and 77 and related dependent claims. This rejection is traversed and reconsideration is requested.

As will be discussed below, Hoshi fails to disclose or suggest the elements of any of the presently pending claims.

Hoshi generally describes improving an accuracy of an oxygen concentration signal output from the oxygen sensor (1) by "controlling the electric power supplied to the heater (2) so that the heater resistance value (Rh) becomes equal to the target value (Rt)" (please refer to D2 I column 6, line 55 - column 8, line 8, Fig. 6 (150), Fig. 7).

In Hoshi, the electric power supplied to the heater is determined depending on the component of the heater resistance value (a heater temperature component), and the component of the element temperature of the oxygen sensor is not used.

Therefore, Hoshi does not disclose to generate a control input to the heater by

using the two components "an input component depending on the difference between the temperature of the active element represented by the element temperature data and the target temperature" and "an input component depending on the temperature of the heater represented by the heater temperature data" as recited in independent claims 1, 39, and 77.

Furthermore, Applicants respectfully submit that the Office Action's rejection is improper under U.S. patent practice. §707.07(d) of the MPEP discloses that "An omnibus rejection of the claim "on the references and for the reasons of record" is stereotyped and usually not informative and should therefore be avoided." This rule requires that a rejection must provide sufficient detail regarding the particular portions of the prior art which the Office Action considers to be relevant to the subject matter of the claims. Statements such as "the whole document" when applying the reference to reject the claims are improper omnibus statements that must be avoided.

Therefore, Applicants respectfully submit that Hoshi does not anticipate all of the claim recitations disclosed in independent claims 1, 39 and 77, and by virtue of dependency claims 2-4, 40-42 and 78-80. It is respectfully requested that the anticipatory rejection to the pending claims be withdrawn.

CONCLUSION:

In view of the above, Applicants respectfully submit that the claimed invention recites subject matter which is neither disclosed nor suggested in the cited prior art. Applicants further submit that the subject matter is more than sufficient to render the claimed invention unobvious to a person of skill in the art. Applicants therefore respectfully request that each of claims 1-4, 39-42 and 77-80 be found allowable and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the Applicants respectfully petition for an appropriate extension of time.

Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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